Massachusetts Department of Environmental Protection

Source Water Assessment and Protection (SWAP) Report

for

Deerfield Fire District

What is SWAP?

The Source Water Assessment Program (SWAP), established under the federal Safe Drinking Water Act, requires every state to:

- inventory land uses within the recharge areas of all public water supply sources;
- assess the susceptibility of drinking water sources to contamination from these land uses; and
- publicize the results to provide support for improved protection.

Susceptibility and Water Quality

Susceptibility is a measure of a water supply's potential to become contaminated due to land uses and activities within its recharge area.

A source's susceptibility to contamination does *not* imply poor water quality.

Water suppliers protect drinking water by monitoring for more than 100 chemicals, disinfecting, filtering, or treating water supplies, and using source protection measures to ensure that safe water is delivered to the tap.

Actual water quality is best reflected by the results of regular water tests. To learn more about your water quality, refer to your water supplier's annual Consumer Confidence Reports.

Table 1: Public Water System Information

PWS Name	Deerfield Fire District
PWS Address	167 Mill Village Road
City/Town	Deerfield
PWS ID Number	1074000
Local Contact	Mr. Brian Dejnak
Phone Number	413-773-3359

Introduction

We are all concerned about the quality of the water we drink. Drinking water wells, springs and reservoirs may be threatened by many potential contaminant sources, including stormwater runoff, road salting, and improper disposal of hazardous materials. Citizens and local officials can work together to better protect these drinking water sources.

Purpose of this report:
This report is a planning tool to support local and state efforts to improve water supply protection. By identifying land uses within water supply protection areas that may be potential sources of contamination, the assessment helps focus protection efforts on appropriate best management practices (BMPs) and drinking water source protection measures.

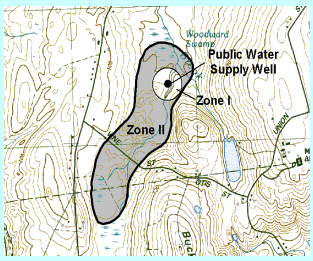
Refer to Table 3 for Recommendations to address potential sources of contamination. Department of Environmental Protection (DEP) staff are available to provide information about funding and other resources that may be available to your community.

This report includes the following sections:

1. Description of the Water System
2. Land Uses within Protection Areas
3. Source Water Protection Conclusions and Recommendations
4. Appendices

What is a Protection Area?

A well's water supply protection area is the land around the well where protection activities should be focused. Each well has a Zone I protective radius and a Zone II protection area.



Glossary

Aquifer: An underground water-bearing layer of permeable material that will yield water in a usable quantity to a well.

Hydrogeologic Barrier: An underground layer of impermeable material (i.e. clay) that resists penetration by water.

Recharge Area: The surface area that contributes water to a well.

Zone I: The area closest to a well; a 100 to 400 foot radius proportional to the well's pumping rate. This area should be owned or controlled by the water supplier and limited to water supply activities.

Zone II: The primary recharge area for the aquifer. This area is defined by hydrogeologic studies that must be approved by DEP. Refer to the attached map to determine the land within your Zone II.

Section 1: Description of the Water System

System Susceptibility: **High**

Spring Names	***Source IDs***
MA GIS Zone II #: 588	***Susceptibility:*** Moderate
Keats Spring	1074000-02G
MA GIS Zone II #: 589	***Susceptibility:*** High
Wells Spring	1074000-03G
MA GIS Zone II #: 590	***Susceptibility:*** High
Harris Spring	1074000-04G
MA GIS Zone II #: 591	***Susceptibility:*** High
Stillwater Spring	1074000-06G
IWPA Upper Reservoir = 1,520 ft. radius	***Susceptibility:*** High
Upper Reservoir Spring	1074000-07G

MA GIS Zone II #: 286	***Susceptibility:*** High
Well Name	***Source IDs***
Stillwater Well	1074000-05G
IWPA Wapping Well = 2,640 ft. radius	***Susceptibility:*** High
Wapping Well	1074000-01G

Deerfield is a small, rural, developing residential and agricultural community located in northwestern Massachusetts in the Connecticut River valley. Deerfield is home to at least three private schools, Historic Deerfield and craft fairs. Light industry has recently expanded into the community. Deerfield's topography is primarily fertile valley in the center of town with north-south trending hills on the east and west sides of town. The Pocumtuck Range trends north-south along the eastern side of town and the Berkshire foothills begin along the west side of town. The Deerfield River flows through the northern portions of town. The Deerfield River flows northwest to southeast through the foothills until it enters the river valley, where it flows north then east to its confluence with the Connecticut River. The Connecticut River flows south and forms the eastern boundary of Deerfield.

Deerfield is served by two water districts: Deerfield Fire District and South Deerfield Water Supply District. The Deerfield Fire District serves the northern parts of town and also serves as a supplement to Eaglebrook School's public

water supply. The Deerfield Fire District maintains and operates seven public water supply sources. There are five spring systems: the Keats Spring (1074000-02G), Wells Spring (1074000-03G), Stillwater Spring (1074000-05G), Harris Spring (1074000-04G) and Upper Reservoir (1074000-07G). Deerfield Fire District also maintains two wells - Stillwater Well (1074000-05G) and Wapping Well (1074000-01G); the Wapping Well is an emergency source that has not been used as a steady source of water since approximately 1980 due to water quality.

Water from the Keats Spring (02G) cistern flows by gravity into the Wells Spring (03G) cistern where the water is disinfected with chlorine. Water then flows to a 50,000 gallon storage/collection cistern, the Upper Reservoir Spring. Water from all three sources continues to flow by gravity to the large 200,000 storage tank and to the distribution system. Excess water from the Wells, Keats, and Upper Reservoir spring systems may overflow the main storage tank. The Keats, Wells and Upper Reservoir spring collection systems are located upon a bedrock high of the Sugarloaf Formation sandstone on the Pocumtuck Range.

The Stillwater and Harris Spring collection systems and the Stillwater Well are installed in glacially deposited sand and gravel at the base of a bedrock (schist) escarpment. The Stillwater and Harris springs are actually comprised of a large number of individual spring boxes that are connected by manifold and eventually flow by gravity together into a pump station (Harris/Stillwater Spring Pump Station). The spring systems were constructed by the Civilian Construction Corps in the 1920s and 1930s. The District does not have accurate construction details, exact number or location of all the spring boxes. In general, each spring box is roughly two feet in diameter and two feet deep with dry stone masonry walls and a gravel bottom. In recent years the District has made an effort to locate the individual spring boxes and work is done to clear away surrounding brush, pour a concrete cap around a locking metal cover and grade the ground around the box to improve the sanitary seal on the box and prevent surface runoff from entering the box.

Benefits of Source Protection

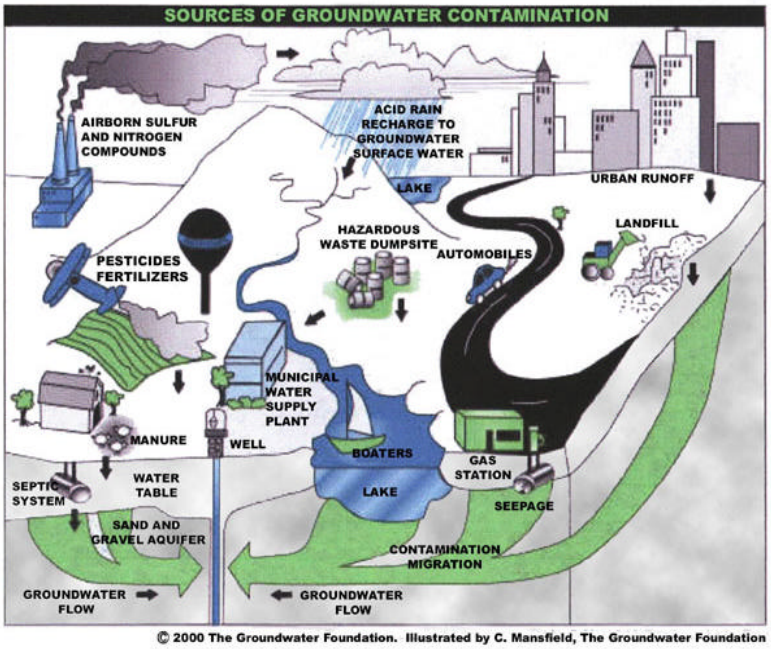
Source Protection helps protect public health and is also good for fiscal fitness:

- Protects drinking water quality at the source
- Reduces monitoring costs through the DEP Waiver Program
- Treatment can be reduced or avoided entirely, saving treatment costs
- Prevents costly contamination clean-up
- Preventing contamination saves costs on water purchases, and expensive new source development

Contact your regional DEP office for more information on Source Protection and the Waiver Program.

At least thirteen individual spring boxes comprise the Stillwater Spring (06G). As many as eight boxes collect flow from the western base of the hill and five boxes collect from the eastern base of the hill. In general, water from the spring boxes located higher on the hill, flows downhill into the lower boxes through buried clay pipe. At the base of the western side of the hill is a large concrete collection tank. Similarly, there is a tank at the base of the eastern set of boxes. Water from both the eastern and the western collection tanks flow to a third tank that collects all of the water from the Stillwater Spring. The collection tanks do not allow natural groundwater infiltration. Water then flows into the Harris/Stillwater Spring Pump Station .

The Harris Spring system (04G) is located along the base of the same hill as the Still water Spring, but is several hundred feet



south of the Stillwater spring system. The Harris spring system is comprised of five spring boxes and a single concrete collection tank. Water then flows from the collection tank to the Harris/Stillwater Pump Station.

The Harris/Stillwater Pump Station (built in 1990) has a 25,000 gallon wet well that collects all the flow from both the Harris and Stillwater spring systems. Provided there is water in the wet well, a single, vertical turbine pump, continuously pumps water (40 gpm) into the distribution system. Occasionally, flow from the spring exceeds the capacity of the pump and the excess water overflows to the Stillwater Brook. Water from the Stillwater Spring passes through a marble chip basket which buffers the pH of the water for minor corrosion control. All water from the Stillwater and Harris Springs is disinfected at the Harris/Stillwater Pump Station prior to distribution.

The Stillwater Well (05G) is located along the southern bank of the Deerfield River near the Stillwater and Harris Spring systems. The well is a 16 x 24-inch diameter gravel packed well, approximately 55 feet deep. The surficial materials within the valley are sand, silt and in some areas are glacio-lacustrine clay deposits laid down during the recession (melting) of the glaciers some 12,000 years ago. In the river valleys, recent alluvial deposits overlay the glacial deposits. The bedrock beneath the valley area and the eastern highlands is mapped as sandstone of the Sugarloaf formation, with the western hills mapped as the Conway Formation, predominantly schist with beds of quartzite.

Through the SWAP program, the Department retained the USGS to delineate the recharge contribution area or Zone II recharge area, for each of the spring sources. The discharge from the springs was estimated based on flow measurements and the area of contribution was delineated based on geologic mapping of bedrock/overburden materials and topography. The Zone II for the Stillwater Well was previously delineated by a consultant utilizing data from an extended duration pumping test, geologic mapping and analytical modeling of the aquifer. Water from the well is treated with soda ash for corrosion control and disinfected with chlorine prior to distribution into the system.

What are "BMPs?"

Best Management Practices (BMPs) are measures that are used to protect and improve surface water and groundwater quality. BMPs can be structural, such as oil & grease trap catch basins, nonstructural, such as hazardous waste collection days or managerial, such as employee training on proper disposal procedures.

The Stillwater and Harris Spring systems and the Stillwater Well Zone II are located within the same unconfined, sand and gravel aquifer and share some of the same recharge area. Although the springs are located within the glacially deposited sand, they are located at the base of a bedrock escarpment and there is significant contribution from the bedrock as well as the overburden. The Zone II for the well and springs include areas south of the Deerfield River on the west side of town. The land use within the recharge area is residential, agriculture and sand and gravel mining.

The Zone II for the Keats Spring (02G) is primarily forest and has numerous school recreational trails throughout the area. The Zone II for the Wells Spring (03G) is primarily forest with recreational trails, but also includes two school dormitories, associated parking and activities, stormwater runoff, and two fuel oil USTs. According to the school, they have

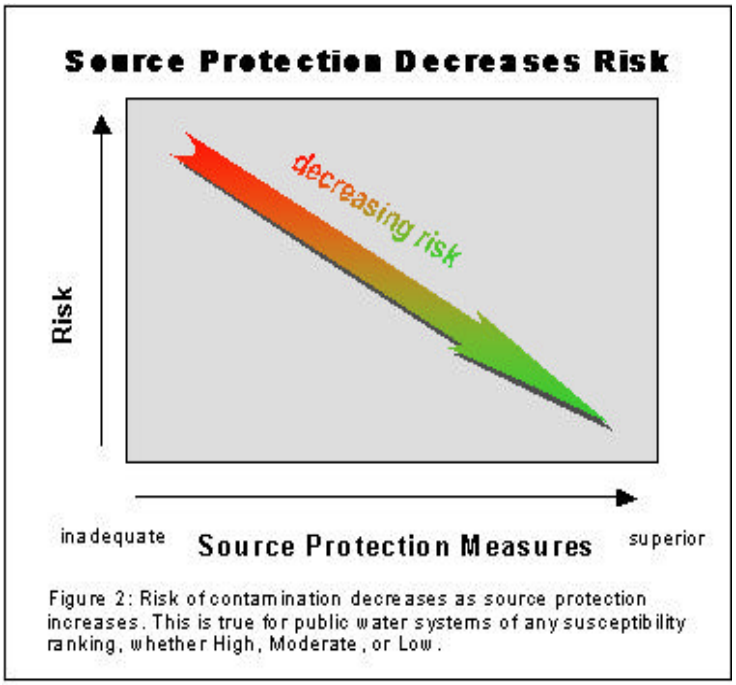


Figure 2: Risk of contamination decreases as source protection increases. This is true for public water systems of any susceptibility ranking, whether High, Moderate, or Low.

Potential Source of Contamination vs. Actual Contamination

The activities listed in Table 2 are those that typically use, produce, or store contaminants of concern, which, if managed improperly, are potential sources of contamination (PSC).

It is important to understand that a release may never occur from the potential source of contamination provided facilities are using best management practices (BMPs). If BMPs are in place, the actual risk may be lower than the threat ranking identified in Table 2. Many potential sources of contamination are regulated at the federal, state and/or local levels, to further reduce the risk.

Table 2: Land Use in the Protection Areas

For more information, refer to Appendix B: Regulated Facilities within the Water Supply Protection Areas

Land Uses	Quantity	Threat	Source ID Zone II/ IWPA	Potential Contaminant Sources*
Agricultural				
Fertilizer/ pesticide storage or use	Numerous	M/H	01G, 04G, 05G, 06G	Fertilizers: leaks, spills, improper handling, or over-application
Commercial				
Maintenance shop	1	H	07G	Petroleum products, solvents, paints: spills, leaks, or improper handling
Residential school	1	M	03G, 07G	Fuel oil, laboratory, art, photographic, machine shop, and other chemicals: spills, leaks, or improper handling or storage, storm-water management
Very Small Quantity Hazardous Waste/ Oil Generator	2	M	01G, 07G	Hazardous materials and waste: spills, leaks, or improper handling or storage
Transportation corridors/ Utility Right-of-way	Numerous	M/H	All	Fuels and other hazardous materials: accidental leaks or spills; pesticides: over-application or improper handling
Underground storage tanks	Numerous	H	03G, 07G	Stored materials: spills, leaks, improper delivery or handling
Sand & gravel mining	1	M	04G, 05G, 06G	Spills or leaks from fuel storage, petroleum leaks from equipment, clandestine dumping, erosion
Aboveground storage tanks	Numerous	L/M	04G, 05G, 06G	Stored materials: spills, leaks, improper delivery or handling
Residential/ Miscellaneous				
Fuel oil storage (at residences)	Numerous	M	01G, 04G, 05G, 06G	Fuel oil household hazardous materials: spills, leaks, or improper handling
Lawn care / Gardening	Numerous	M	01G, 04G, 05G, 06G	Pesticides: over-application or improper storage and disposal
Septic systems / cesspools	Numerous	M	01G, 04G, 05G, 06G	Hazardous chemicals: microbial contaminants, and improper disposal
Aquatic animals	Periodic	H	02G, 03G, 04G, 06G	
Farm dump	1	M/H	05G	Petroleum wastes, hazardous materials, microbial contaminants, inorganic wastes

Notes:

1. When specific potential contaminants are not known, typical potential contaminants or activities for that type of land use are listed. Facilities within the watershed may not contain all of these potential contaminant sources, may contain other potential contaminant sources, or may use Best Management Practices to prevent contaminants from reaching drinking water supplies.
2. For more information on regulated facilities, refer to Appendix B: Regulated Facilities within the Water Supply Protection Area information about these potential sources of contamination.
3. For information about Oil or Hazardous Materials Sites in your protection areas, refer to Appendix C: Tier Classified Oil and/or Hazardous Material Sites.

*** THREAT RANKING** - The rankings (high, moderate or low) represent the relative threat of each land use compared to other PSCs. The ranking of a particular PSC is based on a number of factors, including: the type and quantity of chemicals typically used or generated by the PSC; the characteristics of the contaminants (such as toxicity, environmental fate and transport); and the behavior and mobility of the pollutants in soils and groundwater.

directed most of the stormwater runoff to surface water bodies and to the pond. It has been previously noted that the stormwater BMP controls runoff from Pine Nook Road and the dormitories access roads.

The Zone II for the Upper Reservoir Spring (07G) has not yet been delineated but the land area upgradient of the source includes the Wells Spring Zone II. However, until the Zone II for that spring source has been delineated, an Interim Wellhead Protection Area was calculated based on the estimated yield of the spring source of 35 gpm. The IWPA is a radial area of 1,520 feet and includes all of the Eaglebrook School and much of the Wells Spring Zone II area. Please refer to the attached map to view the boundaries of the Zone II for the well, the Draft Zone II and the IWPA for the springs.

The Upper Reservoir Cistern is located approximately 43 feet upgradient (east) from the edge of a drainage brook. The Eaglebrook School maintenance garage is immediately across the brook with the parking lot for the maintenance garage located 10 feet from the edge of the brook. There is no curb or stormwater control measures in the parking lot. All school maintenance equipment is stored at the garage and the facility is a registered Very Small Quantity Generator of waste oil and hazardous waste and has a gasoline UST for school vehicles. Other materials, dumpsters and the trash pickup truck are also stored in the parking area. These activities may pose a potential threat if runoff from the parking area is allowed to discharge to the brook. Eaglebrook School installed a stormwater collection and drainage system along Pine Nook Road to collect runoff from Pine Nook Road and the access roads to the dormitories south of the road. This BMP helps to protect the springs in the event accidental release along Pine Nook Road or at the dormitories.

In general, the source water area for springs is assumed to be the land area that is topographically uphill (upgradient) of the spring. However, the Department also includes a rectangular area terminating 50 feet downgradient of the spring source within the regulated protection area as a buffer to protect the source. The topography rises north, east and south of the Upper Reservoir Cistern and the Wells Spring is located approximately 300 feet northeast (upgradient) of the Cistern. It is likely that the actual recharge area of the Upper Reservoir Cistern mimics the Zone II of the Wells Spring, although it would obviously start at the spring. It is likely that the maintenance garage and parking areas are not within the recharge area for the Cistern, however, until the recharge area has been determined for that source, caution should be used for all activities in the vicinity of the spring and BMPs should be used for all activities at the garage. Due to the proximity of the drainage swale/brook between the spring and the maintenance garage, precautions should be used to prevent discharges or accidental releases of potentially hazardous material to the drainage area.

Top 5 Reasons to Develop a Local Wellhead Protection Plan

❶ Reduces Risk to Human Health

❷ Cost Effective! Reduces or Eliminates Costs Associated With:

- Increased groundwater monitoring and treatment
- Water supply clean up and remediation
- Replacing a water supply
- Purchasing water

❸ Supports municipal bylaws, making them less likely to be challenged

❹ Ensures clean drinking water supplies for future generations

❺ Enhances real estate values – clean drinking water is a local amenity. A community known for its great drinking water in a place people want to live and businesses want to locate.

The springs and well are located in areas highly vulnerable to contamination from surface sources because there is minimal overburden in the Zone II of the Keats, Wells and Upper Reservoir and there is no protective clay layer. Only sand is logged in the Zone II area for the Stillwater and Harris Springs and the Stillwater Well with no evidence of a protective clay or confining layer. Sources located in this type of environment are considered highly vulnerable to contamination from activities on the land surface. In fact, low levels of 1,2-Dichloropropane, a compound that had been used in agricultural activities was reported during the initial water quality testing of the Stillwater Well, however, it has not been detected since 1981. Spring sources are generally considered to be highly vulnerable to surface contamination and activities or disturbance on the land surface.

The Wapping Well (01G) is a 33 feet deep, 12 x 24-inch diameter, gravel packed well, installed in 1949 and located along Route 5. The well has not been continuously used since about 1980 due to water quality issues associated with elevated levels of iron, manganese and sodium. The well is located approximately 65 feet from Route 5, between Route 5 and an abandoned railroad track; the District owns approximately 1 acre of land around the well. The well utilizes the shallow sand and gravel water table aquifer with an original estimated yield of 163 gpm. The well logs indicate the shallow water table aquifer overlies a clay unit of undetermined thickness. At some point in the past, the production of the well reportedly decreased due to fouling of the screen and the well was redeveloped. The District personnel periodically exercise the pump and collect water quality samples for analysis in the event they should ever need to utilize the well in a water emergency.

The source protection area is an Interim Wellhead Protection Area (IWPA) rather than a Zone II, because the actual recharge area for the well has not been determined. The Zone I and IWPA radii for the Wapping Well are a 400 foot radius and 2,640 foot radius, respectively. There is a surface water divide south of the Wapping Well and based on surface water flow, it is assumed that the shallow groundwater near the Wapping Well likely flows west and north discharging to the Deerfield River. The IWPA includes agricultural, residential and commercial land uses as well as transportation corridors including Route 5 (65 feet from the well) and the Boston & Maine Railroad to the east. A large greenhouse is located just southwest of the well.

The pH of the water from the sources is adjusted for corrosion control and the water is disinfected with chlorine prior to distribution. The District is presently working with the DEP to improve the efficiency of the corrosion control treatment process. For current information on monitoring results, please request a copy of the most recent Consumer Confidence Report from the Public Water System contact person listed above in Table 1.

Section 2: Land Uses in the Protection Areas

The land use within the Zone IIs and IWPA for Deerfield Fire District's sources include mixed use of forest, residential, institutional and agricultural activities, (please refer to attached map for details). Land uses and activities that are potential sources of contamination are listed in Table 2, with further detail provided in the Table of Regulated Facilities and Table of Underground Storage Tanks in Appendix B.

Key Land Uses and Protection Issues include:

1. Non-conforming Zone I
2. Agricultural activities

What is a Zone III?

A Zone III (the secondary recharge area) is the land beyond the Zone II from which surface and ground water drain to the Zone II and is often coincident with a watershed boundary.

The Zone III is defined as a secondary recharge area for one or both of the following reasons:

1. The low permeability of underground water bearing materials in this area significantly reduces the rate of groundwater and potential contaminant flow.

2. The groundwater in this area discharges to a surface water feature such as a river, rather than discharging directly into the aquifer.

Additional Information

To help with source protection efforts, more information is available by request or online at mass.gov/dep/brp/dws including:

1. Water Supply Protection Guidance Materials such as model regulations, Best Management Practice information, and general water supply protection information.

2. MA DEP SWAP Strategy

3. Land Use Pollution Potential Matrix

4. Draft Land/Associated Contaminants Matrix

Contact Catherine V. Skiba in DEP's Springfield Office at (413) 755-2119 for more information and assistance on improving current protection measures.

Copies of this report have been provided to the public water supplier, board of health, and the town.

3. Residential land uses
4. Transportation corridors/utility right-of-way
5. Hazardous materials storage and use
6. Comprehensive wellhead protection planning

The overall ranking of susceptibility to contamination for the system is high, based on the presence of at least one high threat land use within the water supply protection areas, as seen in Table 2. As previously noted, the aquifer that the Stillwater Well utilizes is considered highly vulnerable to contamination from activities on the ground surface due to the lack of a protective confining clay layer. Some springs are inherently highly vulnerability to contamination from surface water and activities in the ground surface.

1. Non-conforming Zone I – The Zone I for the Stillwater Well 05G is a 400-foot radius around the wellhead; the Zone I for the springs are square boxes oriented upgradient from the source. The Zone I area is oriented so that the spring's outlet is centered from side to side and downgradient edge of the Zone I square is 50 feet from the outlet. Massachusetts drinking water regulation (310 CMR 22.00 Drinking Water) requires public water suppliers to own the Zone I, or control the Zone I through a conservation restriction. Only activities directly related to water supply or non-threatening activities are allowed in the Zone I. Many public water supplies were developed prior to the Department's regulation and contain non-water supply activities such as homes and public roads and may not be fully owned by the District. The Department encourages water suppliers to acquire ownership or control of the Zone I area. The District does not own or control the entire Zone I for the Wapping Well as route 5 is within 75 feet of the well. The DEP guidelines for the New Source Approval (NSA) specify that any well not used for more than five years is subject to the NSA. That process evaluates the potential threats to a water supply before it is approved for use.

The Zone I of the springs has been modified based on estimates of flow from the springs. Based on the newly delineated Zone Is, all are non-conforming as the District does not own or control the entire Zone I. The District is presently negotiating the acquisition of additional land in the recharge area of the Harris Spring. The following activities are within the Zone I of the sources:

- Forest with recreational trails throughout
- Pine Nook Road (a very low use, dirt road)
- Stillwater Road
- Hay fields
- Corn fields
- Electrical utility right-of-way
- Private homes
- Maintenance garage parking area

Zone I Recommendations:

- ✓ Communicate with Eaglebrook regarding their continued efforts to control runoff and stormwater at the school and to evaluate stormwater management at the maintenance garage. Encourage the continuation of cleaning up all debris that may have fallen over the bank and into the drainage swale/brook between the spring and the garage. Request that the school consider placing a berm on the edge of the parking area and direct runoff to storm drains south and west of the maintenance garage rather then into the swale/brook.
- ✓ To the extent possible, remove all non-water supply activities from the Zone Is to comply with DEP's Zone I requirements.
- ✓ Use BMPs for the storage, use, and disposal of hazardous materials such as water supply chemicals and maintenance chemicals.
- ✓ Do not use or store pesticides, fertilizers or road salt within the Zone Is.
- ✓ Prohibit new activities from the Zone Is.
- ✓ Communicate with property owners in Zone Is and in Zone IIs proximal to the sources. If they are not aware that they are within the protection areas discuss land uses with them and provide them with BMPs or information regarding protection of the water source as necessary.
- ✓ Agreement Options - Until land is available for acquisition or restriction, attempt to obtain a Memorandum of Understanding and Right of First Refusal.

  A Memorandum of Understanding (MOU) is an agreement between the landowner and public water supplier in which the landowner agrees not to engage in specific threatening activities. The MOU should be specific to the land use or activity. For example, if the land is residential with a septic system, the owner could agree to not place chemicals, petroleum products, or other hazardous or toxic substances, including septic system cleaners, into the

septic system, and agree that the system will be pumped at a specific frequency. Understanding how an activity threatens drinking water quality is an important component of developing an effective MOU.

A Right of First Refusal is a legal document that gives the water supplier the first chance to purchase land when it becomes available. Please refer to the example of the Right of First Refusal documents attached in the Appendices.

The Department strongly recommends that the Deerfield Fire District continue its present efforts to acquire property within the Zone I and Zone II of the spring sources if you intend to continue use of those sources. If there is no other reasonable method to secure rights and protect these sources, the District should seriously consider taking necessary water supply land by eminent domain to protect the sources.

2. Residential Land Uses – A small percentage of the Zone II for the Stillwater sources, Harris spring and the IWPA of the Wapping Well include residential development. Municipal wastewater sewers are not available in the protection areas, therefore, all protection areas utilize septic systems for wastewater disposal. If managed improperly, activities associated with residential areas can contribute to drinking water contamination. Common potential sources of contamination from residential land use include:

- **Septic Systems** – Improper disposal of household hazardous chemicals to septic systems is a potential source of contamination to the groundwater because septic systems discharge to the ground. If septic systems fail or are not properly maintained, they are a potential source of microbial contamination.
- **Household Hazardous Materials** - Hazardous materials may include automotive wastes, paints, solvents, pesticides, fertilizers, and other substances. Improper use, storage, and disposal of chemical products used in homes are potential sources of contamination.
- **Heating Oil Storage** - If managed improperly, Underground and Aboveground Storage Tanks (UST and AST) can be potential sources of contamination due to leaks or spills of the fuel oil they store.
- **Stormwater** – Catch basins transport stormwater from roadways and adjacent properties to the ground. As flowing stormwater travels, it picks up debris and contaminants from streets and lawns. Common potential contaminants include lawn chemicals, pet waste, and contaminants from automotive leaks, maintenance, washing, or accidents.

Residential Land Use Recommendations:

- ✓ Educate residents on best management practices (BMPs) for protecting water supplies. Distribute the fact sheet "Residents Protect Drinking Water" available in Appendix A and on www.mass.gov/dep/brp/dws/protect.htm, which provides BMPs for common residential issues.
- ✓ Work with planners to control new residential developments in the water supply protection areas.
- ✓ Promote BMPs for stormwater management and pollution controls.

3. Transportation corridors and right-of-way - Several local roads are located within the Zone II of the Stillwater and Harris Springs and the Stillwater well. There is also an electric line right-of-way. There are local access roads to the Eaglebrook School and dormitories of the Wells Spring Zone II and the Upper Reservoir IWPA. Roadway construction, right-of-way vegetation maintenance, and typical use can all be potential sources of contamination for springs and wells. De-icing materials, automotive chemicals and other debris on roads are picked up by stormwater and wash into catch basins. As an example, accidents can lead to spills of gasoline and other potentially dangerous transported chemicals. Remote roadways are also frequent sites for illegal dumping of hazardous or other potentially harmful wastes.

In addition, the Wapping Well IWPA has a section of railroad line within the IWAP in the direction that is likely upgradient of the well. Rail corridors serving passenger or freight trains are potential sources of contamination due to chemicals released during normal use, track maintenance, and accidents. Accidents can release spills of train engine fluids and commercially transported chemicals.

Transportation/Right-of-way Corridor Recommendations:

- ✓ Identify stormwater drains and the drainage system along transportation corridors. Wherever possible, ensure that drains discharge stormwater outside of the Zone II.
- ✓ Work with the Town and State to have catch basins inspected, maintained, and cleaned on a regular schedule. Street sweeping reduces the amount of potential contaminants in runoff.
- ✓ Work with local emergency response teams to ensure that any spills within the Zone II can be effectively contained.

- ✓ If storm drainage maps are available, review the maps with emergency response teams. If maps aren't yet available, work with town officials to investigate mapping options such as the upcoming Phase II Stormwater Rule requiring some communities to complete stormwater mapping.
- ✓ Examine the road grade and drainage along roads in the protection areas and evaluate the potential impact on the sources. Consider use of BMPs if the use of these roads increases over time.
- ✓ Promote BMPs for stormwater management and pollution controls.
- ✓ Notify Town officials of potential USDA funding for mitigation and prevention of runoff pollution through the Environmental Quality Incentives Program (EQIP). The USDA web site is www.rurdev.usda.gov or call the Rural Development Manager at the local office in Hadley at 413-585-1000 ex. 4. Review the fact sheet available online and available information about funding at the website http://www.nrcs.usda.gov/programs/farmbill/2002/pdf/EQIPFct.pdf.
- ✓ Review the utility right-of-way Yearly Operating Plan (YOP) to ensure best management practices are implemented with regard to vegetation control in the Zone II, and that the utility has accurate information regarding the locations of the wells and the protection zones. Review the maps the utilities use. The Board of Selectmen or the Conservation Commission may receive the YOP.
- ✓ Work with local officials during their review of the railroad right of way Yearly Operating Plans to ensure that water supplies are protected during vegetation control. Request that the railroad emergency response teams coordinate Emergency Response Drills and practice containment of potential contaminants from accidents within the Zone II. And include the District in their notification list.
- ✓ Work with your local fire department to review emergency response plans. Updates to this plan should include the right-of-way and roadways. Request emergency response teams to coordinate Emergency Response Drills and practice containment of potential contaminants from accidents within the Zone II.

4. Institutional use with hazardous materials storage – The land area within the Zone II for the Wells Spring and the IWPA for the Upper Reservoir cistern includes Eaglebrook School. The school is served by the municipal sewer system and is predominantly topographically downgradient from the spring sources. Two dormitories with underground storage tanks (UST) and internal access roads are located within the delineated Zone II for Wells spring. The entire campus is within the IWPA for the Upper Reservoir cistern spring. The maintenance garage is located approximately 150 feet from the cistern and has a 1,000 gallon gasoline UST and hazardous materials storage; the facility is topographically downgradient and on the opposite side of a drainage divide from the spring. The two dormitories, one older and one new, that are within the Zone II have an 8,000 gallon and 2,500 gallon fuel oil storage USTs, respectively. There are a total of eleven USTs at Eaglebrook School. Most of the tanks were installed between 1984 and 1987; one tank was recently installed at the new dormitory in 2000.

If hazardous materials are improperly stored, used, or disposed, they become significant potential sources of contamination. Hazardous materials should be managed with extreme care in areas served by on-site water supply wells. USTs should be managed with care as well. Delivery should be monitored carefully because many spills occur during delivery.

The school has recently installed stormwater drains and collection system to remove stormwater runoff from the roadway upgradient of the Wells Spring an the Upper Reservoir cistern. According to the District and school facility manger, stormwater is directed toward the pond downgradient of the Wells spring and Upper Reservoir sources.

Institutional use with hazardous materials storage :

- ✓ Encourage the facility manager to incorporate an Integrated Pest Management (IPM) approach into the school's pest management program. IPM is an ecologically-based approach to pest control that links together several related components, including monitoring and scouting, biological controls, mechanical and/or other cultural practices, and pesticide applications. By combining a number of these different methods and practices, satisfactory pest control can be achieved with less impact on the environment. Encourage the facility manager to ensure that any pesticides and fertilizers that are being stored are within a structure designed to prevent runoff and if possible downgradient of Deerfield's and Eaglebrook's water supply sources.
- ✓ Continue discussions with Eaglebrook's Director of the Physical Plant to ensure they continue to handle and dispose hazardous materials properly and that USTs are monitored. Encourage the continued use of BMPs for fuel oil storage, hazardous material handling, storage, disposal, and emergency response planning.
- ✓ Discuss with the school's facility management whether they have overfill containment on the school oil tanks. Suggest installation of overfill protection on tanks that are not equipped with protection.

6. Agricultural activities – There are croplands and pasture lands within the Zone II of the Stillwater and Harris sources of water and the IWPA of the Wapping Well. These lands include hay, corn and other crop fields. Pesticides and fertilizers have the potential to contaminate a drinking water source if improperly stored, applied, or disposed. If not contained or applied properly, animal waste from barnyards, manure pits and field application are potential sources of contamination to ground and surface water. Very often, farms also maintain old disposal areas (farm dumps), heavy equipment and store petroleum products and generate hazardous waste. As with other types of businesses that use, store or generate hazardous materials, proper use, storage and disposal is critical for protecting the environment and minimizing liability. Additionally, historically, farmers often have gravel borrow pits on-site. Disturbance of the overburden upgradient of springs is a significant potential threat to water quality in the springs. Any gravel mining activities

Agricultural activities Recommendation:

- ✓ Work with commercial farmers in your protection areas to make them aware of your water supply and to encourage the use of a USDA Natural Resources Conservation Service (NRCS) farm plan to protect water supplies. Review the fact sheet available online and call the local office in Hadley at 413-585-1000 ex. 4. of the NRCS for assistance http://www.nrcs.usda.gov/programs/farmbill/2002/pdf/EQIPFct.pdf.
- ✓ Encourage farmers to incorporate an Integrated Pest Management (IPM) approach into their pest management program. IPM is an ecologically-based approach to pest control that links together several related components, including monitoring and scouting, biological controls, mechanical and/or other cultural practices, and pesticide applications. By combining a number of these different methods and practices, satisfactory pest control can be achieved with less impact on the environment.
- ✓ Promote the use of BMPs for fuel oil storage, hazardous materials handling, storage, disposal, and emergency response planning.
- ✓ Encourage farmers, including nurseries and commercial property managers to ensure that pesticides and fertilizers are being stored within a structure designed to prevent runoff.
- ✓ The USDA also has various funding sources for government agencies, non-governmental organizations and agricultural facilities through programs such as those listed on the USDA web site: http://search.sc.egov.usda.gov/. One program in particular, the Environmental Quality Incentives Program (EQIP) may be utilized in a variety of projects from DPW stormwater management to farm nutrient management designed to protect surface and groundwater. Review the fact sheet available on line and call the local office of the NRCS for assistance http://www.nrcs.usda.gov/programs/farmbill/2002/pdf/EQIPFct.pdf.
- ✓ Work with any non-commercial farmers by supplying them with information about protecting their own wells and the public water supply by encouraging the use of BMPs. Refer to http://www.state.ma.us/dep/brp/dws/dwspubs.htm and http://www.state.ma.us/dep/consumer/animal.htm#dwqual for additional resources.
- ✓ Note any forest management activities, especially within the Zone II of the springs. Disturbance of the thin overburden material may impact water quality in the springs.

7. Protection Planning - Although Deerfield has water supply protection controls, they do not fully comply with the DEP Wellhead Protection regulation 310 CMR 22.21(2) and do not cover all of the protection areas in Deerfield. A technical assistance (consulting) firm is currently in the process of completing a Wellhead Protection Plan for the Deerfield Fire District. Protection planning protects drinking water by managing the land area that supplies water to a well. A Wellhead Protection Plan coordinates community efforts, identifies protection strategies, establishes a timeframe for implementation, and provides a forum for public participation.

Protection Planning Recommendations:

- ✓ Coordinate efforts with local officials to adopt controls that meet 310 CMR 22.21(2). For more information on DEP land use controls see http://mass.gov /dep/brp/dws/protect.htm.
- ✓ Request that the Boards of Health adopt floor drain controls that meet 310 CMR 22.21 (2) and conduct inspections.

Another land use that was identified in the Zone II is a gravel mining operation near the Stillwater and Harris spring sources. Mining poses numerous threats from accidental release of petroleum products and erosion to illegal dumping in abandoned mines. Spring sources are particularly susceptible to activities that disturb the surface such as mining and forestry. The District should continue to monitor the activities in the Harris Spring Zone II and the Department encourages the efforts to acquire control of that property if you intend to continue use of that source. Additionally, there are commercial land uses within the IWPA of the Wapping Well that may utilize hazardous materials.

Activities within the protection areas that are potential sources of contamination are included in Table 2. Refer to Appendix B for more information about land uses that are permitted facilities and USTs. Identifying potential sources

of contamination is an important initial step in protecting your drinking water sources. Further local investigation will provide more in-depth information and may identify new land uses and activities that are potential sources of contamination. Once potential sources of contamination are identified, specific recommendations like those below should be used to better protect your water supply.

Section 3: Source Water Protection Conclusions and Recommendations

Current Land Uses and Source Protection:
As with many water supply protection areas, the system's Zone IIs contain potential sources of contamination. However, source protection measures reduce the risk of actual contamination, as illustrated in Figure 2. The Deerfield Fire District is commended for:

- current efforts in upgrading the system's infrastructure, and
- for having protective bylaws.

Source Protection Recommendations:
To better protect the sources for the future:

- ✓ Acquire ownership or control of the Zone I and Zone II areas critical to protecting the District's sources.
- ✓ Inspect the Zone Is regularly, and when feasible, remove any non-water supply activities.
- ✓ Educate residents and abutters on ways they can help you to protect drinking water sources through the use of BMPs.
- ✓ Work with emergency response teams to ensure that they are aware of your Zone IIs and will cooperate in responding to spills or accidents.
- ✓ Continue communications with Eaglebrook School to ensure proper storage, handling, delivery and disposal of hazardous materials.
- ✓ Work with farmers in your protection areas to make them aware of your water supply and to encourage the use of a NRCS farm plan to protect water supplies.
- ✓ Implement the Wellhead Protection Plan upon completion and MA DEP approval.

Conclusions:
These recommendations are only part of your ongoing local drinking water source protection. Additional source protection recommendations are listed in Table 3, the Key Issues above and Appendix A.

➢ **Partner with Local Businesses:**
Since many facilities and businesses use hazardous materials and produce hazardous waste products, it is essential to educate these businesses about drinking water protection. Encouraging partnerships among businesses, water suppliers, and communities will enhance successful public drinking water protection practices.

➢ **Educate Residents:**
If managed improperly, household hazardous waste, septic systems, lawn care, and pet waste can all contribute to groundwater contamination. Hazardous materials include automotive wastes, paints, solvents, pesticides, fertilizers, and other substances. If a septic system fails or is not properly maintained, it is a potential source of microbial and nitrogen contamination. Animal waste is also a source of contamination.

➢ **Provide Outreach to the Community:**
Public education and community outreach ensure the long-term protection of drinking water supplies. Awareness often generates community cooperation and support. Residents and business owners are more likely to change their behavior if they know where the wellhead protection recharge area is located, what types of land uses and activities pose threats, and how their efforts can enhance protection.

➢ **Plan for the Future:**
One of the most effective means of protecting water supplies is local planning, including adoption of local controls to protect land use and regulations related to watersheds and groundwater protection. These controls may include health regulations, discharge prohibitions, general ordinances, and zoning bylaws/ordinances that prohibit or control potential sources of contamination within the protection areas.

➢ **Other Funding Sources:**
Other grants and loans are available through the Drinking Water State Revolving Loan Fund, the Clean Water State

Revolving Fund, and other sources. For more information on grants and loans, visit the Bureau of Resource Protection's Municipal Services web site at: http://mass.gov/dep/brp/mf/mfpubs.htm. The USDA also has various funding sources for government, non-government organizations and agricultural facilities through programs such as those listed on the USDA web site at http://search.sc.egov.usda.gov/nrcs.asp?qu=eqip&ct=NRCS. One program in particular, the Environmental Quality Incentives Program (EQIP) may be utilized in a variety of projects from DPW stormwater management to farm nutrient management designed to protect surface and groundwater. Review the fact sheet available online at http://www.nrcs.usda.gov/programs/farmbill/2002/pdf/EQIPFct.pdf and call the local office (Hadley 413-585-1000) of the NRCS for assistance.

The Massachusetts Department of Food and Agriculture's Agricultural Environmental Enhancement Program (AEEP) provides funding to farmers to install a variety of water quality protection practices. For more information on the program contact the coordinator, Susan Phinney, at (617) 626-1772, Susan.Phinney@state.ma.us.

The assessment and protection recommendations in this SWAP report are provided as a tool to encourage community discussion, support ongoing source protection efforts, and help set local drinking water protection priorities. District officials, citizens and community officials should use this SWAP report to spur discussion of local drinking water protection measures. The water supplier should supplement this SWAP report with local information on potential sources of contamination and land uses. Local information should be maintained and updated periodically to reflect land use changes in the Zone II. Use this information to set priorities, target inspections, focus education efforts, and to develop a long-term drinking water source protection plan.

Section 4: Appendices

A. Protection Recommendations
B. Regulated Facilities within the Water Supply Protection Area
C. Additional Documents on Source Protection

Table 3: Current Protection and Recommendations

Protection Measures	Status	Recommendations
Zone I		
Does the Public Water Supplier (PWS) own or control the entire Zone I?	**NO**	Follow Best Management Practices (BMP's) that focus on good housekeeping, spill prevention, and operational practices to reduce the use and release of hazardous materials. Continue efforts to purchase or control activities in the Zone I as feasible.
Is the Zone I posted with "Public Drinking Water Supply" Signs?	**YES**	Additional economical signs are available from the Northeast Rural Water Association (802) 660-4988.
Is Zone I regularly inspected?	**YES**	Continue daily inspections of drinking water protection areas.
Are water supply-related activities the only activities within the Zone I?	**NO**	Continue monitoring non-water supply activities in Zone Is and attempts to acquire Zone I.
Municipal Controls (Zoning Bylaws, Health Regulations, and General Bylaws)		
Does the municipality have Wellhead Protection Controls that meet 310 CMR 22.21 (2)?	**Partial**	Deerfield does have an aquifer protection bylaws. However, they should be reviewed for compliance with 310 CMR 22.21(2) and the overlay district must be modified to include, at a minimum, the Zone II and IWPA protection areas. Please refer local boards to these recommendations and to www.state.ma.us/dep/brp/dws/ for model bylaws and health regulations, and current regulations.
Do neighboring communities protect the Zone II areas extending into their communities?	**N/A**	
Planning		
Does the PWS have a Wellhead Protection Plan?	**In Progress by NeRWA**	Once the plan has been approved by the MA DEP, implement the plan. Follow "Developing a Local Wellhead Protection Plan" available at: www.state.ma.us/dep/brp/dws/.
Does the PWS have a formal "Emergency Response Plan" to deal with spills or other emergencies?	**Partial**	Augment the plan by developing a joint emergency response plan with fire department, Board of Health, DPW, and local and state emergency officials. Coordinate emergency response drills with local teams.
Does the municipality have a wellhead protection committee?	**NO**	Establish a committee; include representatives from citizens' groups, neighboring communities, and the business community.
Does the Board of Health conduct inspections of commercial and industrial activities?	**NO**	For guidance see "Hazardous Materials Management: A Community's Guide" at www.state.ma.us/dep/brp/dws/files/hazmat.doc
Does the PWS provide wellhead protection education?	**NO**	Aim efforts at institutional, commercial, agricultural and residential land uses within the Zone IIs and IWPA.